

FORM KESEPAKATAN SOAL UJIAN ~~D3~~ / ~~Eks. D3~~ → S1 / S1 / S2 (*)
Semester ~~Genap~~ / Ganjil (*) 2021/2022

Kode – Nama Dosen : D5387 – Harvianto, S.Kom, M.T.I.
D6485 – Ivan Halim Parmonangan, S.Kom., M.Eng.
D6422 – Ajeng Wulandari, S.Kom., M.Kom.

Kode – Nama Mata kuliah : COMP6047001 – Algorithm and Programming

Durasi Ujian : 130 Menit

Sifat Ujian : Buka Buku / ~~Tutup Buku~~*

Buku Ujian :

Supporting Tools :

Penggandaan Supporting File :

Learning Outcomes :

- LO 1 : Explain kind of algorithms in problem solving
- LO 2 : Apply syntax and functions in C language in problem solving
- LO 3 : Construct a program using C language in problem solving
- LO 4 : Design a program with file processing using C language in problem solving
- LO 5 : Choose the best sorting and searching algorithm in problem solving

No	Type Soal (*) (Essay /Kasus)	Bobot (%)	LO Terkait	Topik/Materi yang Diujikan
1	Kasus	25	1,2,3	Array, I/O, Math Operation, Looping
2	Kasus	25	1,2,3	Selection, I/O, Array, Char/String, Looping
3	Kasus	25	1,2,3	I/O, Math Operation, Looping
4	Kasus	25	1,2,3	I/O, Math Operation, Looping, Array, Selection

Keterangan: (*) coret atau pilih salah satu

Jakarta, 26 Agustus 2022

Dibuat oleh,

Dicek oleh,

Disetujui oleh,

(D5387 – Harvianto, S.Kom, M.T.I.
D6485 – Ivan Halim Parmonangan,
S.Kom., M.Eng.
D6422 – Ajeng Wulandari,
S.Kom., M.Kom.)
Dosen Pembuat Soal

(D6421 – Muhammad Fikri
Hasani, S.Kom., M.T.)
Dosen SCC

(D5874 – Irene Anindaputri
Iswanto, S.Kom., M.Sc.Eng.)
**Head of Computer Science
Program**

BINUS University

Academic Career: <i>Undergraduate / Master / Doctoral *)</i>		Class Program: <i>International/Regular/Smart Program/Global Class*)</i>	
<input checked="" type="checkbox"/> Mid Exam <input type="checkbox"/> Final Exam <input type="checkbox"/> Short Term Exam <input type="checkbox"/> Others Exam : _____		Term : Odd/Even/Short *)	
<input checked="" type="checkbox"/> Kemanggisan <input type="checkbox"/> Alam Sutera <input type="checkbox"/> Bekasi <input type="checkbox"/> Senayan <input type="checkbox"/> Bandung <input type="checkbox"/> Malang		Academic Year : 2022/2023	
Faculty / Dept. : School of Computer Science Code - Course : COMP6047001 – Algorithm and Programming		Deadline Day / Date : Wednesday, September 28 th 2022 Time : 130 Menit	Class : 10-A, 10-B & 10-C (PPTI 14 15 16)
Lecturer : D5387 – Harvianto, S.Kom, M.T.I. D6485 – Ivan Halim Parmonangan, S.Kom., M.Eng. D6422 – Ajeng Wulandari, S.Kom., M.Kom.		Exam Type : Onsite	
*) <i>Strikethrough the unnecessary items</i>			
<i>The penalty for CHEATING is DROP OUT!!!</i>			

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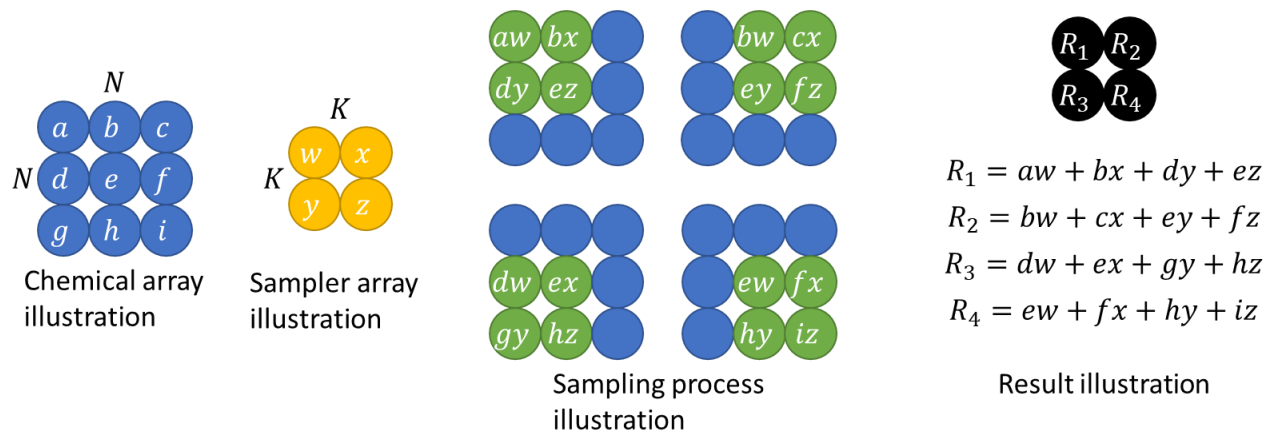
Instructions:

- Please explain your work by adding comments in your code.
- Code without explanation will not receive full score.

1. [25%] **Chemical Reaction.**

A perfume laboratory has $N \times N$ sized chemical array that arranged in a particular pattern. In order to create a perfume sample, several chemicals have to be sampled each with a certain amount and mixed together.

The sampling process could be illustrated as follows:



Several chemical substances within $K \times K$ are taken each with a certain amount with a sampler. It is known that the amount of each sampler head is fixed. Each chemical is represented with a number n and the amount of volume taken for each sampler head can be represented with a number k .

Format Input:

The input begins with inserting T cases followed by the size of the chemical array, N . Then for each case, the program will request $N \times N$ chemical substances represented by n . The program will ask the size of the sampler, K . Followed by $K \times K$ sampler head sizes represented by k .

Constraints:

$$1 \leq T \leq 10$$

$$3 \leq N \leq 100$$

$$2 \leq K \leq N$$

$$0 \leq k, n \leq 100$$

Format Output:

For each case, the program will output a matrix as shown in the example below.

Example:

Input	Output
1 4 2 75 14 40 96 32 28 62 74 65 66 79 33 35 86 11 49 27 58 65 75	7017 9168 16228 11663 14567 13576 14308 12779 8437
2 3 3 38 12 19 61 33 48 60 10 49 62 9 65 70 42 90 61 43 64 5 4 40 35 4 14 62 50 74 38 25 98 9 55 49 64 69 99 27 20 28 36 28 51 58 68 48 15 48 48 12 97 97 4 33 53 70 47 4 45 85 29 43	20901 31065 31235 33332 33483

2. [25%] **Substring Palindrome**

Jojo and Bibi are learning about palindromes. A palindrome is a word, number, phrase, or other sequence of characters which reads the same backward as forward, such as madam or racecar. Jojo and Bibi already understood whether a word is a palindrome or not. Now, they wanted to learn how to count number of unique palindromes that are substrings. As Jojo and Bibi friends, your job is to write a program that reads a sequence of strings and for each string determines the number of unique palindromes that are substrings.

Format Input:

Input consists of 1 sentence S in one line. The sentence only contains lowercase alphanumeric character and no whitespace.

Format Output:

Output one line, print N where N is the number of unique palindromes that are substring

Constraints:

$$1 \leq |S| \leq 1000$$

Sample Input 1

Sample Output 1

Sample Input 2

Sample Output 2

Sample Input 3

Sample Output 3

Explanation:

- 'madam' has 5 unique palindromes which are 'm', 'a', 'd', 'ada' and 'madam'
- 'midterm' has 6 unique palindromes which are 'm', 'i', 'd', 't', 'e', 'r', and 'm'
- 'jojibibi' has 8 unique palindromes which are 'j', 'o', 'b', 'i', 'joj', 'oyo', 'bib' and 'ibi'

3. [25%] **Deposito**

Jojo and Lili want to deposit their money to a bank with M value. They ask you to calculate their credits in N month with interest rate is I % **per annum (yearly)**. You must calculate their credits every month until N month. The interest will be disbursed every month and deduct with the tax (20%). The interest will be added to credits in integer (**round down**).

$$\text{interest/month} = M \times \frac{I\%}{12} \times (100\% - 20\%)$$

Example:

First month,

$$\text{Interest: } \text{round_down}(1000000 \times \frac{5\%}{12} \times (100\% - 20\%)) = 3333$$

$$\text{Credits: } 1000000 + 3333 = 1003333$$

Second month,

$$\text{Interest: } \text{round_down}\left(1003333 \times \frac{5\%}{12} \times (100\% - 20\%)\right) = 3344$$

$$\text{Credits: } 1003333 + 3344 = 1006677$$

Format Input

Input starts with an integer T , describing the number of test cases. Each test case has 3 integers. First integer is M , the money value. The second integer is I , the interest in percentage per annum (yearly). The third integer is N , the duration they deposit their money.

Format Output

For each test case, start with format "Case #X:", where X is the test case number starting at 1 and followed with N lines. Each line shows the month and the money value added interest on that month.

Constraints:

$$1 \leq T \leq 10$$

$$1 \leq N \leq 240$$

$$1 \leq I \leq 10$$

$$1 \leq M \leq 2 \times 10^9$$

Example:

Input	Output
4	Case #1:
1000000 5 6	1 1003333
1000000 5 12	2 1006677
1000000 10 12	3 1010032
3629100 10 6	4 1013398
	5 1016775
	6 1020164
	Case #2:
	1 1003333
	2 1006677
	3 1010032
	4 1013398
	5 1016775
	6 1020164
	7 1023564
	8 1026975
	9 1030398
	10 1033832
	11 1037278
	12 1040735
	Case #3:
	1 1006666
	2 1013377
	3 1020132
	4 1026932
	5 1033778
	6 1040669
	7 1047606
	8 1054590
	9 1061620
	10 1068697
	11 1075821
	12 1082993
	Case #4:
	1 3653294

	2 3677649
	3 3702166
	4 3726847
	5 3751692
	6 3776703

Explanation Case 4:

First month,

$$\text{Interest: } \text{round_down}(3629100 \times \frac{10\%}{12} \times 80\%) = 24194$$

$$\text{Credits: } 3629100 + 24194 = \mathbf{3653294}$$

Second month,

$$\text{Interest: } \text{round_down}(3653294 \times \frac{10\%}{12} \times 80\%) = 24355$$

$$\text{Credits: } 3653294 + 24355 = \mathbf{3677649}$$

Third month,

$$\text{Interest: } \text{round_down}(3677649 \times \frac{10\%}{12} \times 80\%) = 24517$$

$$\text{Credits: } 3677649 + 24517 = \mathbf{3702166}$$

Fourth month,

$$\text{Interest: } \text{round_down}(3702166 \times \frac{10\%}{12} \times 80\%) = 24681$$

$$\text{Credit: } 3702166 + 24681 = \mathbf{3726847}$$

Fifth month,

$$\text{Interest: } \text{round_down}(3726847 \times \frac{10\%}{12} \times 80\%) = 24845$$

$$\text{Credits: } 3726847 + 24845 = \mathbf{3751692}$$

Sixth month,

$$\text{Interest: } \text{round_down}(3751692 \times \frac{10\%}{12} \times 80\%) = 25011$$

$$\text{Credits: } 3751692 + 25011 = \mathbf{3776703}$$

4. [25%] Duo

Bibi works at a store. The store wants to sell a pair of products with a discount. The pair of products must have the same code. Bibi asks you to count pairs of products. Bibi gives you code of N products with **ordered by ascending** (small to bigger).

Format Input

The first line contains an integer T stating the number of test cases. For each test case, the first line contains a single integer N which indicates the number of products. The next line contains N integers X_i ($1 \leq i \leq N$) which indicate i^{th} element in the array.

Format Output

Consists of T lines where each line has the format "Case #X: Y", where X is the test case number starting at 1 and Y is the count of pair product.

Constraints

$$1 \leq T \leq 100$$

$$1 \leq N \leq 10^4$$

$$1 \leq X_i \leq 10^7$$

Sample

Input	Output
3	Case #1: 0
10	Case #2: 3
1 2 3 4 5 6 7 8 9 10	Case #3: 9
10	
2 2 3 3 3 5 9 10 10 10	
20	
2 2 3 4 4 4 4 5 5 5 6 6 7 7 8 8 9 9 10 10	

Explanation Case 3:

Sets: (2, 2), 3, (4, 4), (4, 4), (5, 5), 5, (6, 6), (7, 7), (8, 8), (9, 9), (10, 10)

--Good Luck--